# High Volume, Low-Cost Production Process for High-grade Silicon Carbide Optics , Phase I

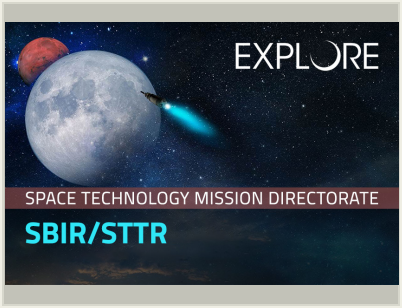
Completed Technology Project (2004 - 2005)

## Project Introduction

The following proposal summarizes the process by which Trex Enterprises will utilize our patented CVC (Chemical Vapor Composite) SiC process towards the fabrication of near net shape lightweight SiC mirrors with high optical performance for both the surface figure and surface roughness of the as-deposited mirror. The as-deposited surface figure and roughness will be optimized through careful selection and preparation processes applied to a variety of mandrel structures and designs. The CVC process replicates the current mandrel surface precisely and this work will look to explore and quantify optically the absolute limits of the surface replication potential of the CVC process. Once this surface has been characterized and optimized, we will then be in a position to either move directly to polishing or eliminate the polishing stage completely from our mirror fabrication process. The savings in both time and cost would greatly improve both the cost of high performance SiC optics as well as reduce the long lead time from many months to as little as several weeks.

## Anticipated Benefits

Similar advantages would also apply to a large variety of DoD programs, as well as commercial applications, especially some of the larger telescope systems currently being designed for land-based systems. Some land-based telescope systems would include the GSMT, Euro 50, OWL, and Kelt, programs. DoD systems currently identified that would have a keen interest in this technology would include the Predator, MKV, EKV, and ADLT systems, among others. The technology developed during this program would be applicable for the rapid production of any large aperture, lightweight, high performance, low cost, SiC optical mirrors for a wide variety of applications. NASA uses would include virtually all land, air or space based systems. It is possible that the technology could be applied to the James Webb telescope, but the timing is likely to lag the desired schedule for that particular system. Other NASA programs in the areas of grazing incidence X-ray, visible, UV-EUV, and solar facing optical systems could also take advantage of the technology developed during this program.

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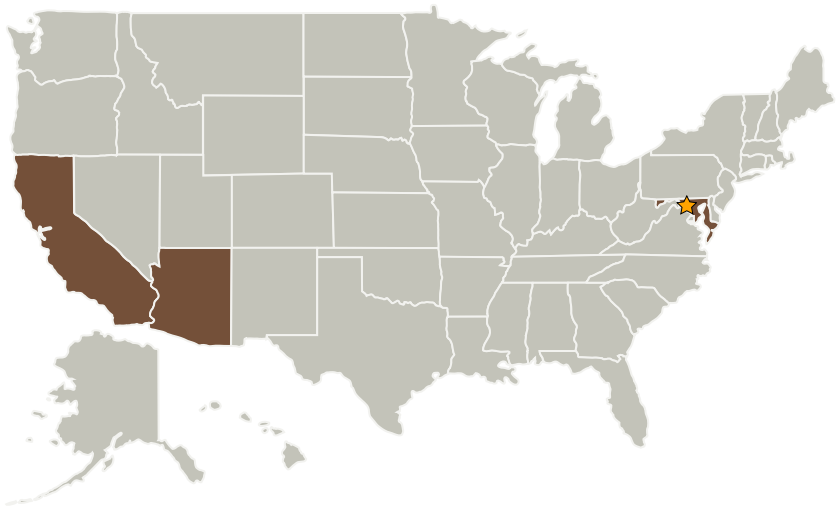
## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Goddard Space Flight Center(GSFC) | Lead Organization | NASA Center | Greenbelt, Maryland |
| Trex Enterprises Corporation | Supporting Organization | Industry | San Diego, California |
| Wyant College of Optical Sciences | Supporting Organization | Academia | Tucson, Arizona |

| Primary U.S. Work Locations | |
|---|---|
| Arizona | California |
| Maryland | |

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Manager:**

Dave Content

**Principal Investigator:**

William Fischer

## Technology Areas

**Primary:**

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing

*Continued on following page.*

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## Technology Areas *(cont.)*

- TX12.4.3 Electronics and Optics Manufacturing Process